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# COVERAGE RATES OF ROUTINE VACCINATIONS AND THE POTENTIAL REASONS OF LOW COVERAGE FOR LIBYAN CHILDREN IN 2017: A CROSS-SECTIONAL STUDY

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## ABSTRACT

**Background**: Vaccinations are still important weapon in modern prevention programs. Limited studies were conducted to assess the childhood vaccination program in Libya. The study aimed to document the coverage rates of routine vaccinations and factors associated with low coverage rate in north-western region of Libya.

**Methods:** A cross-sectional study was prospectively carried out to calculate the coverage rates of routine vaccinations for children aged from the birth to 18 months in Libya. The data were collected from vaccination cards of children who were seeking the vaccine at four public vaccination centers in big three cities located in north-western region of Libya. The data collected during the period from 11 Dec 2017 to 17 Mar 2018 from the vaccination centers. The centers were visited in 44 times for data collection using a questionnaire during the business days.

**Results:** The study checked the vaccination cards of 916 children during the routine vaccination visit at the vaccination centers. Coverage rates of most vaccinations were high (more than 90%). The low coverage rates were found in rotavirus vaccine in second and third doses, 81.3% and 72.2% respectively as well as penta vaccine had a low coverage rate (69.4%). The timeliness of vaccination appointments was irregular in 64.2%. The major reasons of vaccination appointment delay were busy, no vaccine available and careless .

**Conclusion:** National childhood vaccination program is still in good performance. The regular supply of the vaccines and strengthen the parent's awareness for vaccination importance should be taken in the consideration to keep the program in good quality of service for high level of the immunity against vaccine preventable diseases.

**Keywords**: Routine vaccination, Coverage rate, Children, Appointments, Libya.

## INTRODUCTION

Vaccines play a crucial role in preventing people from vaccine-preventable diseases and the best protector of human life, and save more than 2 million children a year [1-4]. Vaccines Antibodies and immune mechanisms can be stimulated by vaccine which is an immune-biological substances for a specific protection against a given disease. Vaccines consist of live modified organisms, killed or inactivated organisms, toxoids, extracted cellular fractions or combination of all [5]. Many diseases have been rapidly decreased by routine vaccination and intensive campaigns such as polio which has been dramatically declined from 350,000 cases in 1988 to 29 cases in 2018 [6], and smallpox being eradicated in 1980 [1]. Vaccines are effective, safe and recommended by world health organization (WHO) and the Centers for Disease Control and Prevention (CDC) [2, 7-9]. All vaccines are always under monitor of scientists to be safe [8]. Side effects of vaccination are always minor such as slight fever, redness, soreness, and swelling; and serious side effects are severe allergic reaction [10-12]. In Libya, All vaccines are being introduced through national immunization program (NIP) by providing 13 routine vaccines given from birth to 15 years old free of charge [13, 14]. NIP is being done under a supervision of national center for disease control (NCDC) providing training, equipments and the technical support to vaccination facilities. Last update of childhood vaccination was in Oct 2013 in which rotavirus and pneumococcal

pneumonia vaccines have been added to the routine vaccination schedule [15, 16]. NCDC estimates the coverage rates of routine vaccinations annually based on reports from vaccination facilities at the regions. There are limited studies published a calculation of coverage rates of vaccinations in Libya. This study aims to calculate the coverage rates of routine vaccinations and determine the factors related to incomplete vaccination among Libyan children aged from birth to 18 months.

## METHODS AND MATERIALS

The study aimed to document the coverage rates of routine vaccinations given to Libyan children aged from birth to 18 months. A prospective cross-sectional study analyzed data to calculate the coverage rates of 13 vaccines given to children from birth to 18 months old during the period of 2017 through NIP which uses public vaccination centers. Also the study evaluated the timeliness of routine vaccination as important factors which could affect the completeness of childhood vaccination.

The study was conducted at four public vaccination centers which were randomly selected in the cities of Mslata, Tarhona and Alkhoms. The studied vaccination centers were distributed as two vaccination centers in Mslata city and one in each of Tarhona and Alkhoms, and made up 16% of all vaccination centers at the three cities. The place of the study is located in north-western region of Libya, and having 8% of whole Libyan population .

### Data Collection

Data were collected during the period from 11 Dec 2017 to 17 Mar 2018 from the vaccination card during seeking the vaccination at the vaccination center. The data were collected from all children aged below 18 months seeking the routine vaccination by checking the previous vaccination in the vaccination card, with consider the current vaccine.

Vaccination centers were visited 44 times for data collection by using a questionnaire during the business days. Libyan child must have 7 appointments at vaccination center to have all routine vaccination through NIP at ages birth for BCG (Birth dose) vaccine, OPV (Zero dose) vaccine and HepB (Birth dose) vaccine; 2 months for Hexa (First dose) vaccine, Pneumococcal (First dose) vaccine and Rota (First dose) vaccine; 4 months for Hexa (Second dose) vaccine, Pneumococcal (Second dose) vaccine and Rota (Second dose) vaccine; 6 months for Hexa (Third dose) vaccine, and Rota (Second dose) vaccine; 9 months for Meningococcal (First dose) vaccine and OPV (Booster dose) vaccine; 12 months for MMR (Basic dose) vaccine, Meningococcal (Second dose) vaccine and Pneumococcal (Third dose) vaccine; 18 months for DTaP+IPV+Hib (Booster dose) vaccine and MMR (Revaccinate) vaccine. The calculation of coverage rate was done for each dose. The vaccination was not daily in all centers but it was scheduled once or two times a week in each center, thus the data collected from the opened center and from others in other days.

## Data Analysis

The coverage rate was estimated for each dose by calculating the proportion of children who received the vaccine. The calculation was conducted by dividing the number of children who received vaccination (numerator) on children who were eligible for vaccination (denominator). Other data were analyzed to achieve the required result by using SPSS software.

## Ethics

Oral consents were obtained from parents to include their children in the study. Management of vaccination centers gave us the permission for data collection.

## RESULTS

Vaccination data were calculated from 916 children aged from birth to 18 months who sought routine vaccination at public vaccination centers. The coverage rates of most vaccines given to children through NIP were high (more than 90%). However, coverage rate of second and third doses of rotavirus vaccine were lower; 81.3% and 72.2%, respectively. Also, coverage rate of penta vaccine given in the eighteen months of age was low (69.4%). Coverage rate of each dose in routine vaccination can be shown in table 1 .

Table 1. Number of vaccinated children and the coverage rate

| Age | Vaccine | Vaccina-ted | Non-vaccinated | Total | Coverage rate % |
|---|---|---|---|---|---|
| Birth | BCG (*Birth dose*) | 916 | 0 | 916 | 100% |
| | OPV (*Zero dose*) | 915 | 0 | 916 | 99.9% |
| | HepB (*Birth dose*) | 916 | 0 | 916 | 100% |
| 2 months | Hexa (*First dose*) | 834 | 41 | 875 | 95.3% |
| | Pneumococcal (*First dose*) | 850 | 33 | 875 | 96.3% |
| | Rota (*First dose*) | 798 | 118 | 875 | 91.2% |
| 4 months | Hexa (*Second dose*) | 675 | 43 | 718 | 94% |
| | Pneumococcal (*Second dose*) | 653 | 65 | 718 | 90.9% |
| | Rota (*Second dose*) | 584 | 134 | 718 | 81.3% |
| 6 months | Hexa (*Third dose*) | 520 | 45 | 565 | 92% |
| | Rota (*Third dose*) | 408 | 157 | 565 | 72.2% |
| 9 months | Meningococcal (*First dose*) | 456 | 19 | 475 | 96% |
| | OPV (*Booster dose*) | 457 | 19 | 476 | 96% |
| 12 months | MMR (*Basic dose*) | 340 | 4 | 344 | 98.8% |
| | Meningococcal (*Second dose*) | 340 | 4 | 344 | 98.8% |
| | Pneumococcal (*Third dose*) | 340 | 4 | 344 | 98.8% |
| 18 months | Penta | 84 | 37 | 121 | 69.4% |
| | MMR (*Revaccinate*) | 119 | 2 | 121 | 98.3% |

Delays on the vaccination appointments were shown in 588 children (64.2%). The main reasons were a busy in work

(28.6%), no vaccine in previous visit (23.3%) and parents don't care about the vaccination (19.3%). In case of unvaccinated children, 94% of them missed their vaccines because of no vaccine available during the visit days (Table 2)

Table 2. Delay vaccination appointment, reasons of the delay and unvaccinated children

| Variable | Number | percentage | P-Value |
|---|---|---|---|
| **vaccination appointment** | | | <0.05 |
| At the appointment | 328 | %35.8 | |
| Delay appointment | 588 | %64.2 | |
| **Reason of delay the appointment** | | | <0.05 |
| Busy in work | 168 | % 28.6 | |
| Came but no vaccine | 137 | %23.3 | |
| Don't care | 113 | %19.3 | |
| Forget appointment | 51 | %8.7 | |
| No transportation | 36 | %6.1 | |
| Vaccination center off | 8 | 1.4% | |
| Others | 74 | 12.6% | |
| **Reasons of unvaccinated children** | | | <0.05 |
| No vaccine available | 315 | 94% | |
| Child sick | 4 | 1.2% | |
| Age restriction | 9 | 2.7% | |
| Others | 7 | 2.1% | |

## DISCUSSION

A prospective cross-sectional study in north-western region of Libya was conducted to document the coverage rates of routine vaccinations and to determine the potential reasons of incomplete routine vaccination for children aged below 18 months. The data were collected form 916 vaccination cards of children who sought vaccines at the vaccination centers. The result of this study is to represent the coverage rates of 2017, which showed that the coverage rates of routine vaccination through NIP were high and achieved the target (more than 90%). The low coverage rate was found in rotavirus vaccine in second dose (81.3%) and third dose (72.2%) and significantly reduction in penta vaccine (69.4%).

In same year, NCDC issued coverage rate more than 95% for all vaccine which depended on the monthly vaccination reports and estimated population statistics. There were no independent surveys to estimate the coverage rates of routine vaccination conducted directly from the children's vaccination cards or house to house. Thus, the official foundations related to immunization should take the routine childhood vaccination researches in the consideration being essential to evaluate NIP in the country.

The study illustrated that the commitment of parent for vaccinating their children is high since the other vaccines were high coverage rates. Since the delay on vaccination appointments was high (64.2%), the main reason of significant low coverage rate of rotavirus vaccine in third dose (72.2%) is attributed to the age restriction which is recommended by national center for disease control in Libya (NCDC) [14]. The age restriction is to prevent giving rotavirus vaccine after the age of 8 months. The problem of giving rotavirus vaccine after 8 months years old is a potential occurrence of intussusceptions disease which is a side effect [17]. The restriction of rotavirus vaccine should be cancelled if the mortality rate is occurred by diarrhea disease as the rotavirus is responsible for more than 50% of the disease [18]. At age of eighteen, penta vaccine had not given to more than 69.4% of eligible children. It is a substantial reduction which could be attributed to vaccine shortage because children received MMR vaccine at the same appointment with penta were 98.3%. The positive trend of parent's awareness for childhood vaccination is still high because the vaccines are safe and effective against the infectious diseases [17]. National immunization system is still in remarkable performance and will contribute to eradicate some disease such polio worldwide. The continuation in evaluating the vaccination program is essential to treat the weak points to keep children free of vaccine preventable diseases .

Each child is appointed for 7 appointments for routine immunization mandated by NIP. The study showed that the delay on the vaccination appointment is significantly high (64.2%). The most reasons of the delay is attributed to parents were busy in work, no vaccine available at the vaccination center and parents neglected to vaccinate their children; 28.6%, 23.3%, 19.3%, respectively. The irregularity in seeking routine childhood vaccination in developing countries is in range of 63%–73% emphasizing the outcomes of this study [19]. According to unvaccinated children, significant difference ($p<0.05$) between the reasons of unvaccinated children were justified to the vaccine deficiency at the vaccination center in 94% of unimmunized children. The performance of the program is still good since most the coverage rates of routine vaccination were achieved the goal of immunization program. Even though the awareness for childhood vaccination is remarkable, the timeliness of attendance should be taken in consideration by parents, and also immunization program management should plan for a significant vaccine supply in regularity time to avoid the shortage of vaccination and subsequently well immunized children .

## CONCLUSION

The coverage rates of childhood vaccination are still in good performance except rotavirus and penta vaccines which were in low coverage rate caused by missing the vaccination appointment and irregular vaccination supply, respectively. The regularity of vaccines supply will efficiently avert the age restriction and the missed opportunities. The components of childhood vaccination program such as cold chain, vaccinator training and suitable equipments should be evaluated for high quality of implementation. There is no doubt the vaccines is playing a significant role in protecting children from vaccine preventable diseases.

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